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**Studies of the Beam Extraction System of the GTS-LHC Electron
Cyclotron Resonance Ion Source at CERN**

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The 14.5 GHz GTS-LHC Electron Cyclotron Resonance Ion Source (ECRIS) provides multiply charged heavy ion beams for the CERN experimental program. The GTS-LHC beam formation has been studied extensively with lead, argon and xenon beams with varied beam extraction conditions using the ion optical code IBSimu. The simulation model predicts self-consistently the formation of triangular and hollow beam structures which are often associated with ECRIS ion beams, as well as beam loss patterns which match the observed beam induced markings in the extraction region. These studies provide a better understanding of the properties of the extracted beams and a way to diagnose the extraction system performance and limitations, which is otherwise challenging due to the lack of direct diagnostics in this region and the limited availability of the ion source for development work.